

AMENDMENTS TO THE CLAIMS

This listing of the claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Withdrawn) A heater, comprising: a mount plate on which a substrate or a jig holding the substrate is loaded;  
an opening formed on the mount plate, which is covered by placing the substrate or the jig; and  
a heating device for applying heat by blowing hot air to a bottom side of the substrate or the jig through the opening.
2. (Withdrawn) The heater as claimed in claim 1, wherein a hot-air circulation path is provided for returning the hot air blown to the substrate or the jig to the heating device side.
3. (Withdrawn) The heater as claimed in claim 1, wherein a thermostat device for controlling a temperature of the substrate is provided at a position above the mount plate.
4. (Withdrawn) The heater as claimed in claim 3, wherein the thermostat device comprises a radiation plate for heating the substrate by radiant heat and a heating section for heating the radiation plate.

5. (Withdrawn) The heater as claimed in claim 3, wherein the thermostat device comprises a heat absorbing plate for depriving heat of the substrate and an endothermic section for cooling the heat absorbing plate.

6. (Withdrawn) The heater as claimed in claim 1, wherein a holding mechanism is provided for securing the substrate or the jig to the mount plate.

7. (Withdrawn) The heater as claimed in claim 1, wherein the jig is a container for holding the substrate by immersing it in a liquid solder composition.

8. (Withdrawn) A reflow apparatus, comprising:  
at least one preliminary heating section for preheating a substrate or a jig holding the substrate;  
at least one reflow section for performing main-heating on the preheated substrate or jig;  
and  
a transporting mechanism for transporting the substrate or the jig through the preliminary heating section and the reflow section, wherein  
the preliminary heating section and the reflow section comprise:  
a mount plate on which a substrate or a jig holding the substrate is loaded;  
an opening formed on the mount plate, which is covered by placing the substrate or the jig; and  
a heating device for applying heat by blowing hot air to a bottom side of the substrate or the jig through the opening.

9. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein a hot-air circulation path is provided for returning the hot air blown to the substrate or the jig to the heating device side.

10. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein a thermostat device for controlling a temperature of the substrate is provided at a position above the mount plate.

11. (Withdrawn) The reflow apparatus as claimed in claim 10, wherein the thermostat device comprises a radiation plate for heating a solder composition by radiant heat and a heating section for heating the radiation plate.

12. (Withdrawn) The reflow apparatus as claimed in claim 10, wherein the thermostat device comprises a heat absorbing plate for depriving heat of a solder composition and an endothermic section for cooling the heat absorbing plate.

13. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein a holding mechanism is provided for securing the substrate or the jig to the mount plate.

14. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein the jig is a container for holding the substrate by immersing it in a liquid solder composition.

15. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein at least one cooling section for annealing the substrate or the jig is provided in addition to the preliminary heating section and the reflow section.

16. (Withdrawn) The reflow apparatus as claimed in claim 15, wherein:

the preliminary heating section, the reflow section, and the cooling section are arranged on a concentric circle; and

the transporting mechanism brings in and out the substrate or the jig to/from the preliminary heating section, the reflow section, and the cooling section by a rotary motion.

17. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein the transporting mechanism comprises a vertical motion mechanism for loading and detaching the substrate or the jig on/from the mount plate through moving it up and down.

18. (Withdrawn) The reflow apparatus as claimed in claim 8, wherein the heating device comprises a function of stopping supply of hot air when the substrate or the jig is not placed on the mount plate.

19. (Withdrawn) The reflow apparatus as claimed in claim 16, wherein the transporting mechanism feeds the substrate or the jig successively to the preliminary heating section and the reflow section.

20. (Withdrawn) The reflow apparatus as claimed in claim 19, wherein the transporting mechanism feeds the substrate or the jig by mixing a dummy work.

21. (Previously Presented) A solder bump forming apparatus for forming a solder bump through heating and reflowing a solder composition on a substrate where a plurality of pad electrodes are provided, wherein:

the solder composition is made of a mixture of solder particles and a liquid material that contains a flux component, which becomes liquid at a normal temperature or when heated; and

a heating device is provided for heating the solder composite from a first side of the

substrate, wherein the heating device blows hot air, and wherein the blowing hot air of the heating device does not directly come in contact with the solder composition on the substrate within a space through which the substrate is conveyed; and

a thermostat device for controlling a temperature of the solder composition is provided at a position above a mount plate, which is located over a second side of the substrate, wherein the thermostat device includes a system in which a cool air or hot air of the thermostat device does not directly come in contact with the solder composition on the substrate within the space.

22. (Canceled)

23. (Previously Presented) The solder bump forming apparatus as claimed in claim 21, wherein the thermostat device comprises a radiation plate for heating the solder composition by radiant heat and a heating section for heating the radiation plate.

24. (Previously Presented) The solder bump forming apparatus as claimed in claim 21, wherein the thermostat device comprises a heat absorbing plate for depriving heat of the solder composition and an endothermic section for cooling the heat absorbing plate.

25. (Original) The solder bump forming apparatus as claimed in claim 21, wherein the heating device applies heat by blowing hot air to a bottom side of the substrate.

26. (Original) The solder bump forming apparatus as claimed in claim 21, wherein the heating device heats a bottom side of the substrate by thermal conduction.

27. (Previously Presented) The solder bump forming apparatus as claimed in claim 21, wherein:

the substrate is immersed in the solder composition within a container; and the heating device heats the solder composition from the first side of the substrate through the container.

28. (Withdrawn) A solder bump forming method, comprising the steps of:

an application step for depositing, in layers, a solder composition, which is made of a mixture of solder particles and a liquid material that contains a flux component and becomes liquid at a normal temperature or when heated, on a substrate comprising a plurality of pad electrodes; and

a reflow step for reflowing the solder composition through heating it from the substrate side.

29. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the application step, the solder composition is deposited all over a face including the plurality of pad electrodes and gaps therebetween.

30. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, the solder composition is heated with a temperature difference provided between heating temperatures on a top-face side and a substrate side of the solder composition.

31. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, the solder composition is heated with almost same temperatures for a top-face side and a substrate side of the solder composition.

32. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, the pad electrodes are heated to a melting point of the solder particles or higher for

melting the solder particles that are in contact with the pad electrodes so as to form a solder coating wet and spread over the pad electrodes and, moreover, the solder particles are united further with the solder coating.

33. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, the solder particles closer to the substrate side are precipitated first by providing a temperature difference such that a heating temperature of the solder composition on a substrate side becomes higher than a heating temperature on a top-face side thereof.

34. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, precipitation of the solder particles is accelerated with convection by generating the convection in the liquid material through providing a temperature difference such that a heating temperature of the solder composition on a substrate side becomes higher than a heating temperature on a top-face side thereof.

35. (Withdrawn) The solder bump forming method as claimed in claim 28, wherein, in the reflow step, heat is applied while the substrate is immersed in the solder composition within a container.

36. (New) The solder bump forming apparatus as claimed in claim 21, further comprising:

the thermostat device being enclosed within a thermostat enclosure;

the heating device being enclosed within a heating device enclosure; and

the thermostat enclosure and heating device enclosure preventing all blowing air of the solder bump forming apparatus from being blown within the space through which the substrate is conveyed.

37. (New) The solder bump forming apparatus as claimed in claim 36, wherein the thermostat enclosure includes a thermostat circulation duct that defines at least part of a thermostat circulation path within the thermostat enclosure, and wherein the heating device enclosure includes a heating device circulation duct that defines at least part of a heating circulation path within the heating device enclosure.

38. (New) The solder bump forming apparatus as claimed in claim 37, wherein the solder bump forming apparatus further comprises:

the thermostat device having a thermostat blower, a main thermostat, a cool/heat storage member, a heat absorbing plate, and a sub-thermostat source;

the heating device having a heat blower, a main heating source, a heat storage member, an opening that is covered, and a sub-heating source; and

the thermostat blower circulates a thermostat medium along the thermostat circulation path, wherein the thermostat circulation path provides a thermostat flow path from the main thermostat source, through the cool/heat storage member, along the heat absorbing plate, through the thermostat circulation duct having the sub-thermostat source therein, to the thermostat blower, and returning to the main thermostat source, and

the heat blower circulates hot air along the heating circulation path, wherein the heating circulation path provides a heating flow path from the main heating source, through the heat storage member, along the covered opening, through the heating device circulation duct having the sub-heating source therein, to the heat blower, and returning to the main heating source.